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CLASSROOM OBSERVATION PROTOCOLS: POTENTIAL TOOLS FOR MEASURING THE IMPACT OF TECHNOLOGY IN THE CLASSROOM

Dr. Peter J. Dirr

Classroom Observation Protocols: Potential Tools for Measuring the Impact of Technology in the Classroom

Background

For the past decade or more, there has been a major national effort in the United States to introduce instructional technology to elementary and secondary school classrooms. By some estimates, federal, state, and local governments have invested about $8 billion per year over the last decade, with roughly half that amount coming from the federal government. The initial goal was to provide *access* to instructional technology (computers, educational software, and instructional materials) to *all* students. As a result of this concentrated effort, today virtually all schools and most classrooms have computers and access to the Internet.

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In recent years, the focus of government investment has shifted from ensuring access to educational technology to assessing the *impact* that technology is having on classroom practices and on how and how much students learn. Some policymakers have begun to question whether the huge investment in technology has actually made a difference in student academic achievement. At the same time, the 2001 *No Child Left Behind* legislation requires that schools prove that the technologies being used in the classroom are contributing to improved teaching and learning. The legislation emphasizes the importance of "evidence-based decision-

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making" and "scientifically-based" educational practices. Schools and school districts are expected to employ practices and technologies that have been proven by research to be effective; they are also expected to use sound research methods to document the impact that those practices and the technologies are having on teaching and learning within their classrooms.

In this paper, we respond to critical issues raised by the policy makers and recent federal legislation by exploring the potential of one class of measurement tools, classroom observation protocols, to document the impact that technology is having on how teachers teach and students learn (i.e., classroom practices).

Classroom observation protocols are not new. In the 1970s, considerable research was done on the topic, and many measurement instruments were developed. Most of that research focused on tracking classroom management and the interactions that took place between teacher and students. The results of that research filled a 15-volume encyclopedia entitled *Mirrors on Behavior.*

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Today, expectations for documentation are more complex than they were in the 1970s. Although the pioneering efforts of Ned Flanders, Egon Guba, Hilda Taba, and others provide a useful foundation, researchers today are finding that even the best of the protocols and instruments developed in the 1970s require significant revisions to make them appropriate for the demands and expectations of the 21st century classroom.

The purpose of this paper is to identify some of the more promising work that is being done on classroom observation protocols, especially those protocols that may be helpful in documenting changes in classroom practices that have resulted from the use of instructional technologies. Our work is based largely on a survey of the literature on classroom observation that is available on the Internet and on telephone follow-up with researchers in selected cases. Our intention is to give the leadership of the Appalachian Technology in Education Consortium (ATEC) and the other Regional Technology in Education Consortia (RTECs) a sense of

what can be accomplished with classroom observation protocols and to acquaint them with the names of key players in the field. We also assess whether this approach can provide convincing documentation of the impact of the use of technology on teaching and learning.

Classroom observation today

Over the past several years, educators and researchers have developed a number of approaches for use in observing and documenting changes in classroom practices. Their efforts have been spurred both by the requirements of federally funded research initiatives and by the evaluations of demonstration programs supported by the National Science Foundation and the U.S. Department of Education. These efforts have taken place at both the elementary/secondary and higher education levels. We focus on the former.

The importance of purpose

One piece of advice that surfaces often in the literature is the importance of aligning the classroom observation protocol to the instructional context and the objectives of the evaluation. A school district might take different observation approaches for different programs within the district. Observation protocols might be helpful tools to:

- *Evaluate* the effectiveness of a school program
- *Assess* the performance of a teacher or a school
- Provide *feedback* to teachers for professional development
- Conduct *basic research* on classroom practices.

Types of classroom observation protocols

The world of classroom observation protocols is complex and largely uncoordinated. Researchers have taken a variety of approaches. Some have built on the prior work of others, but there is little evidence of any attempt to bring cohesion to their efforts.

Some researchers have developed self-administered, reflective approaches for teachers to use as they introduce classroom reforms; others have developed third-party observation approaches. Some protocols focus on changes in attitudes; many address changes in classroom behaviors, especially the interactions among teachers and students.

Classroom observation methods include a wide range of approaches: checklists, inventories, timed interval ratings, holistic ratings, narrative descriptions, logs, questionnaires, rubrics, matrices, models, conceptual grids, and open-ended questions.

An important consideration for researchers, one that is addressed directly by some and implicitly by others, is what unit of instruction they will study. This consideration is especially important when the protocol involves third-party observers. Will they observe an entire class period? A segment? An entire day? An entire course or program? Different protocols observe different units of instruction.

Potential pitfalls

Constructing a classroom observation protocol, especially a protocol involving third-party observers, presents many challenges and potential pitfalls, including:

- *Observer bias.* Each observer approaches the classroom with his or her own experiences and biases. As a result, two observers may focus on different aspects of the classroom, and thus record different phenomena for the same lesson
- *Obtrusiveness.* The presence of one or more observers intrudes on the normal class environment and can lead to lessons that do not represent the norm.
- *Contextual variances*. Every school environment provides a different context in which the observations take place. This variation can affect the record-keeping behaviors of the observers.
- *Labor costs*. Classroom observation is labor intensive, often requiring multiple observers and multiple visits to the

school. One estimate is that it costs about $20,000 to observe the classes in one school.

- *Reliability and validity.* Unless the observers are given extensive training, reliability among raters is likely to be low, and this will reduce the value of the data gathered. Also, unless the ratings are tied to other accepted criteria (such as state or national standards), their validity could be questionable.
- *Links to student performance.* Being able to document classroom practices is valuable, but the real payoff is in being able to link those practices to student academic achievement. Current research efforts have yet to provide this link. (We say more about this problem in the following section.)

A schema

The many approaches to classroom observation protocols are difficult to categorize. We can, however, separate protocols that are self-administered from those that require third-party observers. We can also group protocols into (1) those that are primarily quantitative (e.g., checklists and inventories); (2) those that are primarily qualitative (i.e., they require observers to make judgments and provide narrative descriptions); and (3) those that have both quantitative and qualitative elements (e.g., rubrics that require the observer to convert judgments to ratings for different "levels" of behavior). Many of the protocols that have taken the quantitative or combined approaches to third-party classroom observation have also focused on training observers to a high confidence level in inter-rater reliability and, therefore, in the protocol itself.

In this paper, we do not attempt to discuss all the work that is being done on classroom observation protocols. Instead, we identified 17 protocols that we believe offer the greatest promise. Table 1 lists these protocols and categorizes them according to type.

Table 1: Exemplary classroom observation protocols

Type of protocol	Self-administered	Third-party observer
Quantitative (including checklists and inventories)	LTPT (NCREL/NCRTEC)(1) ATRL (SCRTEC)(2)	RTOP (ACEPT)(5) CLASSROOM OBSERVATION (Littleton)(6) SOM (U of Memphis)(7) TOI (WestEd)(8) TELAR (Penn State)(9) TIC (WestEd)(10)
Qualitative (including narrative descriptions)		CLASSROOM OBSERVATION (Sun Assoc.)(11) SFO (SRI/MSU)(12)
Combination (including rubrics)	UTAP (Utah Education Network)(3) TX STaR (TX Ed. Agency)(4)	COP (Horizon Research, Inc.)(13) COP (CETP/U. of MN)(14) TUOT (WestEd)(15) VCOT (VT Institute. of M/S)(16) TTSC (KY Dept. of Ed.) (17)

All of the protocols listed in table 1 meet the following criteria:

- They have been carefully researched and developed using rigorous, systematic, and objective methodology.
- They were developed by a university faculty, regional education lab, or state education agency, or by a commercial research organization working with those groups.
- They can be applied in a variety of settings so as to have normative data and evidence of validity and reliability.
- They can be presented in sufficient detail and clarity to allow for replication and/or the opportunity to build systematically on their research.
- They may be relevant to the types of classroom observation that are needed to document the impact of the use of technology in the classroom.

Leading classroom observation protocols

In this section, we describe the 17 protocols, noting the categories of classroom activities they include and whether or not they specifically address the question of the use of technology in the classroom.

1. Instrument: LEARNING WITH TECHNOLOGY PROFILE TOOL (LTPT)
   Developed by: *The North Central Regional Educational Laboratory/North Central Regional Technology in Education Consortium*

   Notes: LTPT is a technology-specific, self-administered tool intended primarily for professional growth and development. It uses a 4-point scale to rate indicators of engaged learning (including: vision of learning, tasks, assessment, instructional model, learning context, grouping, teacher roles, and student roles) and indicators of high-performance technology (including access, operability, organization, engageability, ease of use, and functionality). (Available: *http://www.ncrtec.org/capacity/profile/profwww.htm*)

2. Instrument: APPLYING TECHNOLOGY TO RESTRUCTURING AND LEARNING (ATRL)
   Developed by: *The South Central Regional Technology in Education Consortium (SCRTEC) (K. Victoria Dimock)*

   Notes: This is an extensive study of how teachers use computers and technology in constructivist learning environments. It includes self-reporting instrument (the Teaching, Learning and Computing Teacher Survey) as well as a third-party classroom observation instrument. This study looks at the use of technology in the context of constructivist learning environments. (A program description, but not the instrument, is available at: *http://www.sedl.org/work/historical/tap.html*)

3. Instrument: UTAH TECHNOLOGY AWARENESS PROJECT RUBRICS (UTAP)
   Developed by: The Utah Education Network

   Notes: UTAP is an online, self-administered instrument with a total focus on technology. It uses a 4-point scale to help teachers focus on their technology skills in seven areas: basic concepts, productivity, communication/information, classroom instruction, educational leadership, technology implementation, and technology troubleshooting. (Available: *http://wwwj1.uen.org/UTAP*, “Log-in As Guest”)

4. Instrument: TEXAS STaR CHART
   Developed by: *The Texas Education Agency (based on the CEO Forum/ISTE STaR Chart, also adapted by the Tennessee Department of Education)*

   Notes: The Texas StaR Chart is a self-administered instrument that uses a 4-point rubric in four key areas: teaching and learning, educator preparation and development, administration and support services, and infrastructure for technology. This is a technology-specific instrument. (Available: *http://www.tea.state.tx.us/technology/etac/campus_txstar* and *http://www.state.tn.us/education/tennesseestarchart.doc*)

5. Instrument: REFORMED TEACHING OBSERVATION PROTOCOL (RTOP)
   Developed by: *The Arizona Collaborative for Excellence in the Preparation of Teachers (ACEPT), Arizona State University (Michael Piburn and Daiyo Sawada)*

   Notes: In this protocol, no items are specifically "technology" oriented. RTOP uses a 5-point scale to rate lesson design, content, and classroom culture. It also requires narrative evaluations from the observer. (Available: *http://purcell.phy.nau.edu/AZTEC/rtop/RTOP_full*, click on "Using RTOP")

6. Instrument: CLASSROOM OBSERVATION
   Developed by: *Littleton Academy (Colorado)*

   Notes: This protocol modified and simplified the Horizon protocol (see #13 below), reducing it to a single page. This instrument uses a 4-point scale to rate instructional skills, knowledge of content and use of materials, focus on students, and classroom environment. It contains only two items on instructional materials and no items on technology. (Available: *http://www.cde.state.co.us/cdechart/guidebook/adm*)

7. Instrument: SCHOOL OBSERVATION MEASURE (SOM)
   Developed by: *The Center for Research in Educational Policy (CREP), University of Memphis (S. M. Ross, L. J. Smith, and M. J. Alberg)*

   Notes: SOM is a single-page instrument for assessing the quality of an entire school. Raters require extensive rater

training. SOM uses timed observations (ten 15-minute observations in a single day) and a 5-point rating scale of 24 variables in six categories: instructional orientation, classroom organization, instructional strategies, student activities, technology use, and assessment. Two of the 24 variables deal with technology (use of the computer for instructional delivery and technology as a learning tool or resource). This protocol has a companion instrument, Survey of Computer Use (SCU), that records information about student use of computers over the same 15-minute intervals. Information includes computer availability, configurations, student abilities, and student activities while using computers. (A description of work, but not instruments, is available at: *http://www.people.memphis.edu/~coe_crep/instruments/som.htm*)

8. Instrument: TECHNOLOGY OBSERVATION INSTRUMENT (TOI)
Developed by: *WestEd (Mike Timms) (for the Nebraska PT3 Catalyst Project)*

   Notes: TOI is part of a broader assessment process that includes a pre-observation conference. It uses timed intervals (5 minutes) and a 4-point scale to rate class organization, cognitive ability, classroom interaction, student role, student engagement, technology integration, teacher's technology use, and students' technology use. (Available: *http://www.necatalyst.org/MTimms.tech.observ.instrmnt%20final1.pdf*)

9. Instrument: TECHNOLOGY-ENHANCED LESSON ASSESSMENT RUBRIC (TELAR)
Developed by: *Penn State University (Kyle Peck)*

   Notes: Designed to capture data by PDA, this application requires FileMaker V. It uses 3 to 5-point scales to rate appropriateness of technology use, student readiness for tech use, student proficiency with the technologies, teacher proficiency with the technologies, student knowledge of lesson purpose, on-task behavior, quality of student interaction, teacher-student interaction, transitions to and from technology, teacher as facilitator, teacher as instructor, meeting diverse student needs, higher order thinking, tech problems, and student participation. The entire focus of this instrument is on technology

use. (A description, but not the instrument, is available at: *http://www.iu5.org/imts/ptla_web/pdf/KylesReadMe.pdf*)

10. Instrument: TECHNOLOGY IN THE CLASSROOM TEACHER RUBRIC (TIC)
    Developed by: *WestEd (Harvey Barnett)*

    Notes: Developed as an aid for principals, this instrument focuses entirely on technology. TIC uses a 4-point scale to rate many variables in five broad areas of technology use: productivity, multimedia and communication, research and problem solving, specific content/subjects, and teaching practice. (Available: *http://www.westedrtec.org*)

11. Instrument: CLASSROOM OBSERVATION
    Developed by: *Sun Associates*

    Notes: This single-page instrument uses a combination of narrative and a 3-point scale to rate classroom activity/lesson, student groupings and interactions, and technology and/or instructional materials used. It captures the number of computers in the classroom and other notes on the teaching environment. (Available: *http://www.sun-associates.com/eval/clsobsv.html*)

12. Instrument: STEP FACULTY OBSERVATION (SFO)
    Developed by: *SRI/Montana State University*

    Notes: SFO is a largely open-ended instrument that gathers assessment information on instructional setting, teaching methods employed, instructional goals and objectives, evidence of student learning, student engagement, relevance to the real world, student and teacher questioning, and use of technology. This instrument is used mainly in teacher education programs at the university level. (Available: *http://oerl.sri.com/instruments/te/obsvclassrm/instr76.html*)

13. Instrument: CLASSROOM OBSERVATION PROTOCOL (COP)
    Developed by: *Horizon Research, Inc. (Refined with several educational organizations. See, for example, #6 above and #14 below.)*

Notes: This protocol, which is part of a larger assessment process that includes a pre-classroom observation interview, originally focused on math and science. This protocol uses a combination of checklists and 5-point scales to describe and rate classroom demographics, lesson description, lesson purpose, instructional materials, classroom instruction, design, implementation, (math/science) content, and classroom culture. It also requires an observer to provide an overall rating and a "quality capsule." Few items deal directly with technology or instructional materials. (Available: *http://www.horizon-research.com/LSC/manual/0102/tab6/cop0102.pdf*)

14. Instrument: CLASSROOM OBSERVATION PROTOCOL (COP)
Developed by: *The Collaborative for Excellence in Teacher Preparation (CETP) in conjunction with Horizon Research, Inc. (used by the Texas CETP and also by the University of Minnesota CETP)*

Notes: This protocol uses timed intervals (5 minutes) and a 5-point scale to rate type of instruction, student engagement, cognitive activity, and key indicators. It also requires an observer to provide a "capsule description" of the quality of the lesson. This protocol was originally designed for math and science, and the only reference to technology is the category "utilizes technology" in the "type of instruction." (Available: *http://www.sci.tamucc.edu/txcetp/admin/documents/ClassObProt2002.pdf*)

15. Instrument: TECHNOLOGY USE: OBSERVATION TOOL (TUOT)
Developed by: *WestEd (Harvey Barnett and Susan Brooks)*

Notes: This protocol uses a 5-point scale and narrative ("stages of use") to rate 30 variables in three areas: learning environment, student technology use, and lesson implementation. The focus is entirely on technology use. (Available: *http://www.westedrtec.org*)

16. Instrument: VERMONT CLASSROOM OBSERVATION TOOL (VCOT)
    Developed by: *The Vermont Institute for Science, Math, & Technology (VISMT), in conjunction with the Education Development Center (EDC)/ Northeast and Islands Regional Technology in Education Consortium (NEIRTEC), and VITA-Learn (modeled after work done by the Science and Math Program Improvement (SAMPI) at Western Michigan University and Horizon Research, Inc.)*

    Notes: VCOT is part of a broader assessment process that includes both pre-observation and post-observation interview. The protocol focuses on four areas: planning and organization of a lesson, implementation of a lesson, content of a lesson, and classroom culture. It imbeds technology criteria within those four areas. (This instrument is closely held by the developers and is released only as part of the extensive training that is required. It was not available for review to determine how extensively technology criteria are covered.) (A description of the program, but not the instrument, is available at: *http://www.vismt.org/programs/leadership/vcot.html*)

17. Instrument: TEACHER TECHNOLOGY STANDARD CONTINUUM (TTSC)
    Developed by: *Kentucky Department of Education, Division of School Instructional Technology*

    Notes: Although it was not developed strictly as a classroom observation protocol, this scoring guide (rubric) provides a continuum of technology skills that principals and other administrators can use to track teachers' accomplishment of the Kentucky Teacher Technology Standard. This protocol uses a 4-point scale plus commentary in 16 areas of technology knowledge and application. Examples of these knowledge areas include: knows technology terminations; knows how technology is used in business and the community; knows how to use the computer and peripherals; uses word processing, databases, e-mail, and presentation software to enhance productivity and support learning; creates multimedia presentations; uses assistive technologies for students with special needs; encourages lifelong learning through technology; uses technol-

ogy for individual, small group, and large group instruction; uses technology to assess student learning; instructs students in ethical and legal uses of technology. The Kentucky Department of Education also makes available a Technology Impact Review Tool, a set of interview questions for all stakeholders to determine how effectively a district or a school is using technology. (Available: *http://www.kde.state.ky.us/oet/customer/evaluation.asp*)

Discussion

Our purpose was to identify several classroom observation protocols that can be used to build a body of research-based evidence documenting the effect of educational technology on classroom practices. This evidence was to be consistent with the intent of the *No Child Left Behind* legislation.

Our review of the literature revealed that several dozen observation protocols have been developed in recent years. A few of these protocols are rooted in the extensive work done by researchers in the 1970s. Some are self-administered and might be used by teachers to reflect on their classroom practices, including the use of technology. Others are third-party observer protocols that have been developed to provide an objective assessment of the quality of classroom practices.

...self-administered instruments … are not likely to lead to scientifically-based research evidence that would withstand professional scrutiny.

Although teachers may find the self-administered instruments to be valuable tools that may, in fact, lead to improved classroom practices, they are not particularly useful to our purpose here. They are not likely to lead to scientifically-based research evidence that would withstand professional scrutiny.

Third-party observer protocols hold the greatest promise for building a body of research evidence on the effectiveness of the use of technology in the classroom. They are more likely than self-administered instruments to:

- Document classroom use of technology within a broader framework of classroom practices
- Contain a sufficient emphasis on technology to detect its contribution to teaching and learning
- Measure changes in practices over time
- Have been carefully tested for validity and reliability
- Be administered unobtrusively (i.e., with minimum distraction to students or teacher)
- Be administered efficiently (i.e., require a reasonable amount of observer time).

Some of the instruments reviewed in this study are well developed and carefully tested and are effective for documenting the classroom environment in general. They include:

- The Reformed Teacher Observation Protocol from the Arizona CEPT project
- The Classroom Observation Protocols developed by Horizon Research and CEPT and Sun Associates.

These two instruments might be particularly appropriate for use in assessing changes in classroom dynamics when teachers use constructivist approaches. However, they pay so little attention to the role of technology that they are likely to overlook its contribution to the classroom.

Other instruments are more focused on technology but, due to insufficient research, may not be ready for widespread use. These protocols include:

- The Technology Observation Instrument from WestEd
- The Technology in the Classroom Teacher Rubric from WestEd
- Technology Use: Observation Tool from WestEd
- The Technology-Enhanced Lesson Assessment Rubric from Penn State
- The Teacher Technology Standard Continuum from the Kentucky Department of Education.

These instruments deserve further consideration and might be developed into useful instruments with further testing and validation.

Other efforts that deserve careful consideration are quite far along in the development process:

- The School Observation Measure (SOM) and the companion instrument, Survey of Computer Use (SCU), the comprehensive school approach (i.e., school-wide assessment plus the Survey of Computer Use) developed by the University of Memphis/CREP
- Applying Technology to Restructuring and Learning (ATRL), the blended approach (i.e., self-administered and third-party observation) of the South Central Regional Technology in Education Consortium.

Conclusion

We have responded to critical issues raised by both federal and state policy makers about the effectiveness of the government's investment in educational technology over the past decade. Our review of the literature suggests that the development and systematic use of a classroom observation protocol focused on the role of technology in the classroom could contribute significantly to building a body of evidence of changes in classroom practices. National surveys and accountability reporting data have provided useful insights, but policymakers are still uncertain about the extent to which specific technologies can affect classroom practices. This report is the first step in a two-step process designed to measure the impact of technology in education. The second step would involve measuring the specific effects that technologies are having on student academic achievement and on the conditions that stimulate learning. Such an ambitious and complex undertaking would require a concentrated effort and at least five years of sustained funding. It would require serious consideration of the type of student achievement to be measured, taking into account the nascent work that is now being done to articulate a body of 21st century skills.

… policymakers are still uncertain about the extent to which specific technologies can affect classroom practices.

Both the tracking of changes in classroom practices and testing the impact on student academic achievement are consistent with the expectations of the *No Child Left Behind* legislation for research-based educational practices. They are also consistent with the Education Sciences Reform Act of 2002, which established the Institute of Education Sciences, including a new National Center for Education Research (NCER). One of the missions of NCER is to "improve student academic achievement through the use of educational technology."

New funding opportunities for measuring the impact of technology on teaching and learning are anticipated. Priority will be on funding field-initiated research that follows "scientifically-based research standards." In addition to the legislative authorities that, between FY 2002 and FY 2006, will provide states and local school districts with nearly $5 billion, serious attention is being given to assessing the impact of technology on classroom practices and student academic over this same period.

Contacts

For more information about the classroom observation protocols discussed in this report, contact the following people:

1. LEARNING WITH TECHNOLOGY PROFILE TOOL
   Kristin Ciesemier, Director
   North Central Regional Technology in Education Consortium
   1120 East Diehl Road, Suite 200
   Naperville, IL 60563-1486
   (630) 649-6500 (P)
   (630) 649-6700 (F)
   ncrtec@ncrel.org

2. TECHNOLOGY INTEGRATION PHASES
   K. Victoria Dimock
   Director, South Central Regional Technology in Education Consortium
   Southwest Educational Development Laboratory
   211 E 7th Street
   Austin, TX 78701
   (512) 476-6861, x 219 (P)
   vdimock@sedl.org

3. UTAH TECHNOLOGY AWARENESS PROJECT RUBRICS
   Steve Hess
   Utah Education Network
   101 Wasatch Drive
   Salt Lake City, UT
   (801) 581-2310 (P)
   shess@media.utah.edu

4. TEXAS STaR CHART
   Anita Givens, Senior Director
   Educational Technology Advisory Committee
   Texas Education Agency
   Educational Technology Division
   1701 North Congress Avenue
   Austin, TX 78701
   (512) 463-9400 (P)
   (512) 463-9090 (F)
   etac@tmail.tea.state.tx.us

5. TENNESSEE STaR CHART
   Jerry Bates, Director of Applied School Technology
   710 James Robertson Parkway
   Andrew Johnson Tower, 6th Floor
   Nashville, TN 37243-0382
   (615) 532-6287 (P)
   (615) 532-7510 (F)
   Jerry.Bates@state.tn.us

6. REFORMED TEACHING OBSERVATION PROTOCOL
   Mike Piburn
   AZ Collaborative for Excellence in the Preparation of Teachers (ACEPT)
   College of Education
   Arizona State University
   Tempe, AZ 85287-0911
   602-965-0261 (P)
   602-965-9144 (F)
   mike.piburn@asu.edu

7. CLASSROOM OBSERVATION
   Littleton Academy
   Mary Ann Campbell, Principal
   1200 West Mineral Avenue
   Littleton, CO 80120
   (303) 798-5252 (P)
   (303) 798-0298 (F)
   mcampbell@lps.k12.co.us

8. SCHOOL OBSERVATION MEASURE
   Steven M. Ross
   Center for Research in Educational Policy
   University of Memphis
   325 Browning Hall
   Memphis, TN 38152-3340
   (901) 678-2310 (P)
   (866) 670-6147 (F)
   smross@memphis.edu

9. TECHNOLOGY OBSERVATION INSTRUMENT
   Mike Timms
   WestEd
   730 Harrison Street
   San Francisco, CA 94107-1242
   (415) 615-3210 (P)
   (415) 615-3426 (F)
   mtimms@wested.org

10. TECHNOLOGY-ENHANCED LESSON ASSESSMENT RUBRIC
    Kyle Peck
    Education Department
    Pennsylvania State University
    411D Keller Building
    University Park, PA 16802
    (814) 863-4316 (P)
    (814) 865-0128 (F)
    kpeck@psu.edu

11. TECHNOLOGY IN THE CLASSROOM TEACHER RUBRIC
    Harvey Barnett
    WestEd
    730 Harrison Street
    San Francisco, CA 94107-1242
    (415) 615-3116 (P)
    (415) 615-3177 (F)
    hbarnet@wested.org

12. CLASSROOM OBSERVATION
    Jeff Sun
    Sun Associates
    55 Middlesex Street
    Suite 216
    North Chelmsford, MA 01863
    (978) 251-1600 (P)
    (978) 251-8700 (F)
    info@sun-associates.com

13. STEP FACULTY OBSERVATION
    Elisabeth Swanson
    Montana STEP Project Administrative Office
    Montana State University
    401 Linfield Hall
    Bozeman, MT 59717
    (406) 994-6768 (P)
    step@mathfs.math.montana.edu

14. CLASSROOM OBSERVATION PROTOCOL
    Iris R. Weiss
    Horizon Research Inc.
    326 Cloister Court
    Chapel Hill, NC 27514
    (919) 489-1725 (P)
    (919) 493-7589 (F)
    hri@horizon-research.com

15. CLASSROOM OBSERVATION PROTOCOL
    Frances Lawrenz
    University of Minnesota
    Burton Hall
    178 Pillsbury Drive SE
    Minneapolis, MN 55455
    (612) 625-2046 (P)
    lawrenz@umn.edu

16. TECHNOLOGY USE: OBSERVATION TOOL
    Harvey Barnett
    WestEd
    730 Harrison Street
    San Francisco, CA 94107-1242
    (415) 615-3116 (P)
    (415) 615-3177 (F)
    hbarnett@wested.org

17. VERMONT CLASSROOM OBSERVATION TOOL
    Nicole Saginor
    Associate Executive Director
    Vermont Institute for Science, Math, & Technology
    7 West Street
    Montpelier, VT 05602
    (802) 828-0068 (P)
    (802) 828-0076 (F)
    nsaginor@vermontinstitutes.org

18. TEACHER TECHNOLOGY STANDARD CONTINUUM
    Lydia Wells-Sledge
    Director
    Division of School Instructional Technology
    Kentucky Department of Education
    500 Mero Street, 19th Floor
    Frankfort, KY 40601
    (502) 564-7168 (P)
    (502) 564-6470 (F)
    lsledge@kde.state.ky.us

Author

Dr. Peter J. Dirr, Public Service Telecommunications Corporation

Dr. Peter J. Dirr is President of the Public Service Telecommunications Corporation, a not-for-profit company that helps schools, universities, libraries, and church groups in the U.S. and abroad use telecommunications technologies to achieve their missions.

Dr. Dirr was also founder and Director of the Cable in the Classroom Professional Development Institute, which, through its computer centers in the Washington, DC area, traveling laptop computer labs, and virtual workshops on the Internet, trained tens of thousands of teachers per year in effective use of video and Internet resources in their classes.

Dr. Dirr has worked for 39 years in the education and telecommunications fields. He has taught communications courses at a public university (State University of New York College at Buffalo) for six years; and at a private university (Manhattanville College) for three years. In addition, Dr. Dirr worked for two years as Manager of Utilization and Interim Director of School Services at the largest public television station in the United States (WNET, New York). He also worked for three years at the Central Administration of the State University of New York, where he established a statewide educational recordings library.

The longest span of Dr. Dirr's professional career (16 years) was spent at the Corporation for Public Broadcasting (CPB), where he was a founding staff member and Deputy Director of the Annenberg/CPB Project. Dr. Dirr also served as the President of the Catholic Telecommunications Network of America (CTNA), where he committed three years of his professional life to helping the Catholic Church make effective uses of telecommunications technologies. He also served as Executive Director of Fairfax Cable Access Corporation, the public access television, radio, and Internet facilities for Fairfax, Virginia.

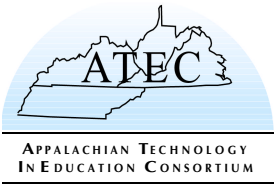
In the 1970s, Dr. Dirr was involved in research and development in effective uses of media in special education, and he conducted

pioneering research in mainstreaming handicapped children into regular classes. He also conducted the first studies of the extent to which television, radio, and computers were used in elementary and secondary schools and postsecondary classes in the U.S.

As Deputy Director of the Annenberg/CPB Project, Dr. Dirr established a reputation as a leader in distance education in the United States. He developed and managed the Project's research and evaluation program. He has written extensively in the field and traveled widely to share his experiences with educators and broadcasters in other countries. Dr. Dirr served as the first Vice President (U.S.A.) and Board Member of the Consorcio Red de Educacion A Distancia (CREAD) from 1993 to 1995. He also served six years (1992-1998) as a member of the Council (Board of Directors) of the Open University of Hong Kong. Dr. Dirr has lectured on distance education and educational uses of communications technologies at universities in fourteen countries.

Dr. Dirr has served as external evaluator for three federally funded FIPSE/LAAP projects. He also serves on the editorial board of the electronic Journal of Instructional Science and Technology and the International Review of Research in Open and Distance Learning.

Dr. Dirr holds a Ph.D. in Communications in Higher Education (New York University), a Masters degree in Guidance and Counseling (Fairfield University), and a Bachelor's degree in Philosophy (St. Joseph's Seminary and College).



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